DOCUMENT RESUME

ED 375 391 CS 011 866

AUTHOR	Pressley, Michael; And Others
TITLE	Transactional Instruction of Reading Comprehension Strategies. Perspectives in Reading Research No. 5.
INSTITUTION	National Reading Research Center, Athens, GA.; National Reading Research Center, College Park, MD.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	94
CONTRACT	117A20007
NOTE	41p.
AVAILABLE FROM	National Reading Research Center, 318 Aderhold, University of Georgia, Athens, GA 30602-7125.
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Elementary Education; *Instructional Effectiveness; Qualitative Research; *Reading Comprehension; *Reading Research; *Reading Strategies; Teacher Attitudes
IDENTIFIERS	Research Suggestions; Transactional Strategies Instruction

ABSTRACT

Focusing on the teaching of comprehension strategies, this paper describes studies designed to identify settings in which effective strategies instruction was being carried out and details the conclusions that can be drawn from the studies. The paper begins with a description of comprehension strategies instruction in the 1970s and 1980s. The paper then discusses a series of qualitative studies undertaken of two successful comprehension strategies instructional programs--the Benchmark School in Media, Pennsylvania which serves high-ability elementary students who experience difficulties in learning to read, and the Montgomery County, Maryland, public schools program, Students Achieving Independent Learning (SAIL), created for Chapter 1 students. The paper then analyzes the instruction in terms of its transactional qualities, its place among constructivist theories of learning, and with regard to theories of intelligent assistance. The paper also includes teachers' ideas about how comprehension strategies instruction might be made more effective. It concludes with a discussion of three directions for future research: better instruction at the primary level, teacher development, and strategies across the curricula and school day. Contains 97 references. (RS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 375 391

Transactional Instruction of Reading Comprehension Strategies

Michael Pressley
University at Albany
State University of New York

in long-term collaboration with
Pamela El-Dinary
Georgetown University
Rachel Brown
University at Buffalo
State University of New York

Ted L. Schuder
Maryland Department of Education
Baltimore, Maryland
Maryrose Pioli
Minnetonka, Minnesota
Kathy Green
Rosetree-Media School District
Media, Pennsylvania
SAIL Faculty and Administration
Montgomery County Public Schools, Rockville, Maryland

Irene Gaskins
Benchmark School Faculty
Benchmark School, Media, Pennsylvania

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

CS011846

NRRC National Reading Research Center

PERSPECTIVES IN READING RESEARCH NO. 5
Fall 1994

BEST COPY AVAILABLE

NRRC

National Reading Research Center

Transactional Instruction of Reading Comprehension Strategies

Michael Pressley
University at Albany
State University of New York

in long-term collaboration with
Pamela El-Dinary
Georgetown University
Rachel Brown
University at Buffalo
State University of New York

Ted L. Schuder
Maryland Department of Education
Baltimore, Maryland
Maryrose Pioli
Minnetonka, Minnesota
Kathy Green
Rosetree-Media School District
Media, Pennsylvania
SAIL Faculty and Administration
Montgomery County Public Schools, Rockville, Maryland

Irene Gaskins
Benchmark School Faculty
Benchmark School, Media, Pennsylvania

PERSPECTIVES IN READING RESEARCH NO. 5
Fall 1994

The work reported herein is a National Reading Research Project of the University of Georgia and University of Maryland. It was supported under the Educational Research and Development Centers Program (PR/AWARD NO. 117A20007) as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed here do not necessarily reflect the position or policies of the National Reading Research Center, the Office of Educational Research and Improvement, or the U.S. Department of Education.

NRRC National Reading Research Center

Executive Committee
Donna E. Alvermann, Co-Director
University of Georgia
John T. Guthrie, Co-Director
University of Maryland College Park
James F. Baumann, Associate Director
University of Georgia
Patricia S. Koskinen, Associate Director
University of Maryland College Park
Nancy B. Mizelle, Acting Associate Director
University of Georgia
Jamie Lynn Metsala, Interim Associate Director
University of Maryland College Park
Linda C. DeGroff
University of Georgia
John F. O'Flahavan
University of Maryland College Park
James V. Hoffman
University of Texas at Austin
Cynthia R. Hynd
University of Georgia
Robert Serpell
University of Maryland Baltimore County

Publications Editors

Research Reports and Perspectives
Linda DeGroff, Editor
University of Georgia
James V. Hoffman, Associate Editor
University of Texas at Austin
Mariam Jean Dreher, Associate Editor
University of Maryland College Park

Instructional Resources
Lee Galda, *University of Georgia*

Research Highlights
William G. Holliday
University of Maryland College Park

Policy Briefs
James V. Hoffman
University of Texas at Austin

Videos
Shawn M. Glynn, *University of Georgia*

NRRC Staff
Barbara F. Howard, Office Manager
Carmie R. Bush, Senior Secretary
University of Georgia

Barbara A. Neitzey, Administrative Assistant
Valerie Tyra, Accountant
University of Maryland College Park

National Advisory Board
Phyllis W. Aldrich
Saratoga Warren Board of Cooperative Educational Services, Saratoga Springs, New York
Arthur N. Applebee
State University of New York, Albany
Ronald S. Brandt
Association for Supervision and Curriculum Development
Marshá T. DeLain
Delaware Department of Public Instruction
Carl A. Grant
University of Wisconsin-Madison
Walter Kintsch
University of Colorado at Boulder
Robert L. Linn
University of Colorado at Boulder
Luis C. Moll
University of Arizona
Carol M. Santa
School District No. 5
Kalispell, Montana
Anne P. Sweet
Office of Educational Research and Improvement, U.S. Department of Education
Louise Cherry Wilkinson
Rutgers University

Dissemination Coordinator
Jordana E. Rich
University of Georgia

Text Formatters
Michael R. Latimer
Ann Marie Vanstone
University of Georgia

NRRC - University of Georgia
318 Aderhold
University of Georgia
Athens, Georgia 30602-7125
(706) 542-3674 Fax: (706) 542-3678
INTERNET: NRRC@uga.cc.uga.edu

NRRC - University of Maryland College Park
2102 J. M. Patterson Building
University of Maryland
College Park, Maryland 20742
(301) 405-8035 Fax: (301) 314-9625
INTERNET: NRRC@umail.umd.edu

About the National Reading Research Center

The National Reading Research Center (NRRC) is funded by the Office of Educational Research and Improvement of the U.S. Department of Education to conduct research on reading and reading instruction. The NRRC is operated by a consortium of the University of Georgia and the University of Maryland College Park in collaboration with researchers at several institutions nationwide.

The NRRC's mission is to discover and document those conditions in homes, schools, and communities that encourage children to become skilled, enthusiastic, lifelong readers. NRRC researchers are committed to advancing the development of instructional programs sensitive to the cognitive, sociocultural, and motivational factors that affect children's success in reading. NRRC researchers from a variety of disciplines conduct studies with teachers and students from widely diverse cultural and socioeconomic backgrounds in prekindergarten through grade 12 classrooms. Research projects deal with the influence of family and family-school interactions on the development of literacy; the interaction of sociocultural factors and motivation to read; the impact of literature-based reading programs on reading achievement; the effects of reading strategies instruction on comprehension and critical thinking in literature, science, and history; the influence of innovative group participation structures on motivation and learning; the potential of computer technology to enhance literacy; and the development of methods and standards for alternative literacy assessments.

The NRRC is further committed to the participation of teachers as full partners in its research. A better understanding of how teachers view the development of literacy, how they use knowledge from research, and how they approach change in the classroom is crucial to improving instruction. To further this understanding, the NRRC conducts school-based research in which teachers explore their own philosophical and pedagogical orientations and trace their professional growth.

Dissemination is an important feature of NRRC activities. Information on NRRC research appears in several formats. *Research Reports* communicate the results of original research or synthesize the findings of several lines of inquiry. They are written primarily for researchers studying various areas of reading and reading instruction. The *Perspective Series* presents a wide range of publications, from calls for research and commentary on research and practice to first-person accounts of experiences in schools. *Instructional Resources* include curriculum materials, instructional guides, and materials for professional growth, designed primarily for teachers.

For more information about the NRRC's research projects and other activities, or to have your name added to the mailing list, please contact:

Donna E. Alvermann, Co-Director
National Reading Research Center
318 Aderhold Hall
University of Georgia
Athens, GA 30602-7125
(706) 542-3674

John T. Guthrie, Co-Director
National Reading Research Center
2102 J. M. Patterson Building
University of Maryland
College Park, MD 20742
(301) 405-8035

NRRC Editorial Review Board

Patricia Adkins
University of Georgia

Peter Afflerbach
University of Maryland College Park

JoBeth Allen
University of Georgia

Patty Anders
University of Arizona

Tom Anderson
University of Illinois at Urbana-Champaign

Harriette Arrington
University of Kentucky

Irene Blum
Pine Springs Elementary School
Falls Church, Virginia

John Borkowski
Notre Dame University

Cynthia Bowen
Baltimore County Public Schools
Towson, Maryland

Martha Carr
University of Georgia

Suzanne Clewell
Montgomery County Public Schools
Rockville, Maryland

Joan Coley
Western Maryland College

Michelle Commeyras
University of Georgia

Linda Cooper
Shaker Heights City Schools
Shaker Heights, Ohio

Karen Costello
Connecticut Department of Education
Hartford, Connecticut

Karin Dahl
Ohio State University

Lynne Diaz-Rico
California State University-San Bernardino

Pamela Dunston
Clemson University

Jim Flood
San Diego State University

Dana Fox
University of Arizona

Linda Gambrell
University of Maryland College Park

Valerie Garfield
Chattahoochee Elementary School
Cumming, Georgia

Sherrie Gibney-Sherman
Athens-Clarke County Schools
Athens, Georgia

Rachel Grant
University of Maryland College Park

Barbara Guzzetti
Arizona State University

Jane Haugh
Center for Developing Learning Potentials
Silver Spring, Maryland

Beth Ann Herrmann
University of South Carolina

Kathleen Heubach
University of Georgia

Susan Hill
University of Maryland College Park

Sally Hudson-Ross
University of Georgia

Cynthia Hynd
University of Georgia

Robert Jimenez
University of Oregon

Karen Johnson
Pennsylvania State University

James King
University of South Florida

Sandra Kimbrell
West Hall Middle School
Oakwood, Georgia

Kate Kirby
Gwinnett County Public Schools
Lawrenceville, Georgia

Sophie Kowzun
Prince George's County Schools
Landover, Maryland

Linda Labbó
University of Georgia

Rosary Lalik
Virginia Polytechnic Institute

Michael Law
University of Georgia

Sarah McCarthey
University of Texas at Austin

Veda McClain
University of Georgia

Lisa McFalls
University of Georgia

Mike McKenna
Georgia Southern University

Donna Mealey
Louisiana State University

Barbara Michalove
Fowler Drive Elementary School
Athens, Georgia

Akintunde Morakinyo
University of Maryland College Park

Lesley Morrow
Rutgers University

Bruce Murray
University of Georgia

Susan Neuman
Temple University

Caroline Noyes
University of Georgia

John O'Flahavan
University of Maryland College Park

Penny Oldfather
University of Georgia

Joan Pagnucco
University of Georgia

Barbara Palmer
Mount Saint Mary's College

Mike Pickle
Georgia Southern University

Jessie Pollack
Maryland Department of Education
Baltimore, Maryland

Sally Porter
Blair High School
Silver Spring, Maryland

Michael Pressley
State University of New York at Albany

Tom Reeves
University of Georgia

Lenore Ringler
New York University

Mary Roe
University of Delaware

Nadeen T. Ruiz
California State University-Sacramento

Rebecca Sammons
University of Maryland College Park

Paula Schwanenflugel
University of Georgia

Robert Serpell
University of Maryland Baltimore County

Betty Shockley
Fowler Drive Elementary School
Athens, Georgia

Susan Sonnenschein
University of Maryland Baltimore County

Steve Stahl
University of Georgia

Anne Sweet
Office of Educational Research and Improvement

Liqing Tao
University of Georgia

Ruby Thompson
Clark Atlanta University

Louise Tomlinson
University of Georgia

Sandy Tumarkin
Strawberry Knolls Elementary School
Gaithersburg, Maryland

Sheila Valencia
University of Washington

Bruce VanSledright
University of Maryland College Park

Chris Walton
Northern Territory University
Australia

Janet Watkins
University of Georgia

Louise Waynant
Prince George's County Schools
Upper Marlboro, Maryland

Priscilla Waynant
Rolling Terrace Elementary School
Takoma Park, Maryland

Dera Weaver
Athens Academy
Athens, Georgia

Jane West
Agnes Scott

Steve White
University of Georgia

Allen Wigfield
University of Maryland College Park

Shelley Wong
University of Maryland College Park

About the Authors

Michael Pressley is a Professor of Educational Psychology and Statistics, University at Albany, State University of New York, and a principal investigator with the National Reading Research Center. He has published extensively in the areas of reading, memory, and cognition and instruction. His current work is diverse, including studies of exemplary primary-level reading instruction, comprehension strategies instruction, and student use of graphing calculators in post-secondary mathematics.

Pamela El-Dinary and **Rachel Brown** were both graduate students working at the National Reading Research Center, University of Maryland, when this article was written. Pam is now a researcher at Georgetown University and Rachel is an assistant professor of educational psychology at University of Buffalo, State University of New York.

Ted L. Schuder was the curriculum designer responsible for the SAIL program. **Maryrose Pioli** and **Kathy Green** were teachers in the program through spring 1993. Maryrose now resides in Minnetonka, Minnesota and Kathy teaches in the Rosetree-Media Schools outside Philadelphia. **The SAIL Faculty and Administration** who participated in the collaborative research that permitted this article include more than two dozen educators, most of whom continue to use SAIL in their Montgomery County, Maryland classrooms.

Irene Gaskins is the founder and director of **Benchmark School**, who, along with the **Benchmark School Faculty**, collaborated with Pressley to study the transactional strategies instruction at Benchmark. Benchmark is in Media, Pennsylvania, outside Philadelphia.

National Reading Research Center
Universities of Georgia and Maryland
Perspectives in Reading Research No. 5
Fall 1994

Transactional Instruction of Reading Comprehension Strategies

Michael Pressley
University at Albany
State University of New York

in long-term collaboration with
Pamela El-Dinary
Georgetown University
Rachel Brown
University at Buffalo
State University of New York

Ted L. Schuder
Maryland Department of Education
Baltimore, Maryland
Maryrose Pioli
Minnetonka, Minnesota
Kathy Green
Rosetree-Media School District
Media, Pennsylvania
SAIL Faculty and Administration
Montgomery County Public Schools, Rockville, Maryland

Irene Gaskins
Benchmark School Faculty
Benchmark School, Media, Pennsylvania

> To know psychology, therefore, is absolutely no guarantee that we shall be good teachers. To advance to that result, we must have an additional endowment altogether, a happy tact and ingenuity to tell us what definite things to say and do when the pupil is before us. That ingenuity in meeting and pursuing the pupil, that tact for the concrete situation, though they are the alpha and omega of the teacher's art, are things to which psychology cannot help us in the least. (William James, 1899/1958, p. 24)

For two decades, I have been interested in children's use of strategies — that is, the processes they use when performing demanding tasks. Teaching students to use effective strategies, especially cognitive strategies they do not use autonomously, has been of particular interest. Because of the importance of learning from text, much of my work in the past six years has been concerned with strategies that can increase children's comprehension and memory

of what they read. Thus, the focus of this paper is the *teaching of comprehension strategies*.

I have never contended that strategies instruction alone could produce skilled reading, thinking, or remembering (see Pressley, Borkowski, & Schneider, 1987, 1989; Schneider & Pressley, 1989). Rather, my view is that students must be taught strategies in conjunction with knowledge they already possess. For strategies to be coordinated with factual and conceptual knowledge, the learner must possess metacognitive knowledge, including the knowledge of when, where, and how to use strategies. In addition, the active use of strategies and other knowledge depends on students' motivation to learn, for example, the text being used in class.

My interest in instructional issues has meant that most of my theories about the nature of effective thinking have been posed as theories of instruction (e.g., Harris & Pressley, 1991; Pressley, Borkowski, & Schneider, 1989; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989; Pressley, Harris, & Marks, 1992). I have proposed, for example, that effective strategies instruction must be long--term and aimed at developing the coordinated use of strategies in conjunction with other knowledge. Such instruction must be metacognitively rich, including information about where and when to use the strategies taught. Although extensive practice is necessary to promote the efficient and automatic use of strategies, such practice permits additional opportunities to discover how, when, and where to use the strategies one already knows. Effective instruction develops in students the sense that they can be effective thinkers.

My perspective shares components with other popular theories of intelligent cognition. All such models include *procedural knowledge* (e.g., strategies), *declarative knowledge* (i.e., nonstrategic factual knowledge), and *metacognition* (e.g., Baron, 1985; Brown, Bransford, Campione, & Ferrara, 1983; Chipman, Segal, & Glaser, 1985; Nickerson, Perkins, & Smith, 1985; Segal, Chipman, & Glaser, 1985). The emphasis on motivation in my model reflects increasing scholarly interest in the role of motivation in determining academic cognition (see Borkowski, Carr, Rellinger, & Pressley, 1990; Pressley, El-Dinary, Stein, Marks, & Brown, 1992). I suggest that effective instruction should enhance understanding of strategies, nonstrategic knowledge, metacognition, and academic motivation.

I originally developed my theories of instruction like many psychologists do, by reflecting on research; theories of thinking, learning, and development; professional interactions with schools; and personal experiences as a student. I have abandoned that approach, convinced that psychology provides only part of what must be known in order to propose realistic and complete instructional theories. More positively, effective educators have been able to take the many instructional prescriptions provided by psychologists and transform these bare-bones and inadequate ideas about teaching thinking into pedagogy that fits into school and transforms the thinking of students. As the opening quote by William James implies, my view is that teacher ingenuity is an important part of successful instruction, and compelling theories of instruction must capture educators' insights. The ideas of skilled teach-

ers are well-grounded in experiences, whereas the experiments and quantifiable observations so preferred by the educational psychology community in the past are not sufficient to the task of generating sound instructional theory.

The research tactic my colleagues and I have taken in the past three years has been to identify educational settings in which effective strategies instruction was being carried out, in particular, the effective teaching of reading comprehension strategies. Then, a variety of qualitative methods (Lincoln & Guba, 1985; Strauss & Corbin, 1990) were used to document the nature of the strategies instruction occurring in these settings (see Pressley, El-Dinary, Gaskins et al., 1992). These qualitative investigations produced a detailed understanding of the components of strategies instruction in two successful programs. The first was in Benchmark School in Media, Pennsylvania, which serves high-ability elementary students who experience difficulties learning to read; most Benchmark students do learn to read and subsequently succeed in regular education. The second was a comprehension program developed in and used by the Montgomery County, Maryland, public schools. This program was created for Chapter 1 students and produced much better reading comprehension in at-risk students than did other instructional programs.

This perspective will describe these studies and detail the conclusions about instruction that can be drawn from them. The instruction will then be analyzed in terms of its *transactional qualities*, its place among *constructivist theories of learning*, and with regard to *theories of intelligent assistance*. Although the instruction we have analyzed is far from being perfected, the teachers in these programs are in a good position to provide insights about possible improvement. Thus, the perspective concludes with teachers' ideas about how comprehension strategies instruction might be made more effective.

COMPREHENSION STRATEGIES INSTRUCTION IN THE 1970s AND 1980s

Most research on comprehension strategies instruction has been of the following form: A researcher believes that if students would construct representations of text (e.g., mental images representing the story or summaries), or react to texts in a certain way (e.g., relate them to prior knowledge and seek clarifications when unsure of meaning), both the comprehension and long-term memory of texts would improve. These experimenters usually had reasons to believe that students were not already engaging in such thinking when reading, or that they were doing so less systematically and completely than they could. Thus, the experimenter created instruction to stimulate the desired thinking processes. The reading comprehension of students receiving such instruction, as measured by an objective test of understanding (e.g., multiple-choice items over literal and inferred messages in text), was compared to the reading comprehension of students not receiving such instruction (e.g., control subjects permitted to read as they normally would in preparation for an objective test). When strategy-trained students outperformed control students, the experimenter concluded that the students probably were not

using the new strategies on their own or were not using them systematically. More positively, students could be taught to do so. Students were production deficient — to use Flavell's (1970) term — in that they were capable of producing the strategies but did not unless they were instructed to do so.

Many such experiments in the 1970s and 1980s produced evidence that students could benefit from instructions to use a number of thinking strategies aimed at improving learning from text (see Pearson & Dole, 1987; Pressley, Johnson, Symons, McGoldrick, & Kurita, 1989). Among these were:

- *Summarization:* constructing of summaries of text content as reading proceeds.

- *Representational imagery:* constructing internal images to represent the meaning of text.

- *Mnemonic imagery:* constructing images that transform text meaning to make it more memorable (e.g., when reading a biography of Charles Dickens, imagining each of the events occurring to a "Mr. McGoo" Scrooge in order to remember that these were events in Dickens' life, rather than events from some other biography).

- *Story grammar analysis:* explicitly identifying and attending to the setting, characters, problems, and resolutions in a story. Remembering these permits recall of the most critical parts of the story.

- *Question generation:* thinking of questions bout the meaning of text as reading proceeds.

- *Prior knowledge activation:* relating what one already knows to related information contained in text. If this activation occurs before reading, it can be the basis of expectations about of the content of text.

A collection of strategies resulted that can be applied before (e.g., making predictions based on prior knowledge), during (e.g., imagery generation), and after (e.g., summarization) reading (Levin & Pressley, 1981). Even so, this research was not aimed at the coordinated use of strategies before, during, and after reading but rather at the validation of a specific strategy. More complicated studies of cognitive strategy instruction were required, because many sophisticated models of thinking were emerging in which multiple strategies were needed to make sense of the world, including worlds created in texts (e.g., Baron, 1985; Brown et al., 1983; Levin & Pressley, 1981; Nickerson et al., 1985).

Several major investigations of this type were conducted in the 1980s. For example, Scott Paris and associates (e.g., Paris & Oka, 1986) developed a set of lessons that could be used during a year of elementary reading instruction. "Informed Strategies for Learning" included instruction of many of the strategies that had been validated in research, as well as attention to the metacognitive and motivational components of strategy use. Although approximately 20 weekly lessons resulted in improved performance on some of the specific tasks practiced in the curriculum, more general changes, such as those documented by standardized reading comprehension assessments, did not occur.

More positively, Duffy et al. (1987) reported success with a year of instruction in which

third-grade teachers recast the skills they taught as strategies. These teachers provided many possible explanations of how to attack text and comprehend it. Collins (1991) produced improved comprehension in fifth- and sixth-grade students by providing a semester (three days a week) of lessons on reasoning skills. She taught her students to seek clarification when uncertain, look for patterns and principles, analyze decision-making that occurs during text processing, solve problems (using backward reasoning and visualization), summarize, predict, adapt ideas in text (including rearranging parts of ideas in text), and negotiate interpretations of texts. Although the trained students did not differ from controls before the intervention with respect to standardized comprehension performance, there was a difference of 3 *SD*s between treated and control conditions on the posttest. Bereiter and Bird (1985) demonstrated that students in the seventh and eighth grades benefit from instructions to use strategies that more sophisticated readers use, such as restating difficult text, backtracking as necessary, watching for pertinent information in text, and resolving apparently anomalous information in text. These data, combined with Duffy et al.'s (1987) and Collins' (1991) outcomes, make me optimistic that instruction in the use of multiple strategies is an intervention that can be effective during most of the elementary- and middle-school years.

Notably, the research of Duffy et al. (1987), Collins (1991), and Bereiter and Bird (1985) used direct explanations of cognitive strategies by teachers to students. In all three cases the teachers helped students make their mental processes public by thinking aloud (i.e., mental modeling; Duffy, Roehler, & Herrmann, 1988). Students were provided extensive practice opportunities; teachers assisted during practice only as required. And, in all three cases, there was opportunity for gradual acquisition of the repertoire of strategies as well as long-term instruction in the coordination of those competencies.

The best-known multiple-strategies intervention developed during the 1980s was *reciprocal teaching of comprehension strategies*, perhaps because this was the first classroom-deployed multiple-strategies intervention that seemed to promote reading comprehension (Palincsar & Brown, 1984). This intervention produced consistent increases in lower-ability students' use of processes such as prediction, clarification, question-generation during reading, and summarization. This type of instruction often produced at least modest gains on more general measures (e.g., standardized reading comprehension; for a review, see Rosenshine & Meister, 1994).

Reciprocal teaching of the four comprehension strategies occurs in reading groups. An adult teacher introduces the prediction, clarification, questioning, and summarization strategies to the group using explanations and modeling, and helps the group as needed. The role of the adult teacher in group functioning is downplayed, however. For any lesson sequence, one of the students is designated "teacher" of the group; this student leads a discussion of the content. This student leader typically begins the discussion of a segment of text by asking a question and concludes by offering a summary, that leads to a prediction about subsequent text content. The adult teacher, provides prompting and feedback to members of the group as needed.

Palincsar and Brown (1984) believed that this instructional arrangement is extremely

motivating. The availability of feedback as needed should reduce frustration and increase task persistence and long-term participation in such groups is presumed to lead to the internalization of the cognitive processes practiced in the group. This expectation is consistent with the idea (Vygotsky, 1978) that interpersonal processes can be internalized by individuals and become the basis for intrapersonal cognitive processes.

In summary, by the end of the 1980s, there was substantial evidence that instruction in some specific cognitive process improves text comprehension. In addition, a few investigators succeeded in teaching multiple strategies in ways that improved reading comprehension, as measured by standardized comprehension instruments. Information about how real educators were translating strategies instruction into effective educational practice was missing, however. As I reflected on this issue near the end of the 1980s (see Pressley, El-Dinary, Brown, et al., in press, for extensive commentary on these reflections), I had many questions. For example, I knew of educational researchers who were having some success using cognitive strategies instruction of various sorts in school, e.g., Deshler & Schumaker, 1988; Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Gaskins & Elliot, 1991). However, the strategies instruction they were offering to students was long-term, that is provided over years. Why did such instruction take so long? In addition, strategies instruction was clearly taking place in the context of an ongoing curriculum: How was it meshed with other parts of the school day? As I read the experimental studies, including the ones detailing multiple-strategies interventions, I felt that little attention was being paid to the instructional dynamics of lessons — the interweaving of teacher and student behaviors that form the basis of instruction. What did complete strategies instruction lessons look like? What do years of such lessons look like? These concerns were disturbing because I suspected that the dissemination of effective strategies instruction might be facilitated if educators could be informed about how successful teachers adapt the recommendations of theoreticians and researchers to real schools. It was time to produce such information.

EFFECTIVE STRATEGIES INSTRUCTION PROGRAMS

Before attempting a systematic study of effective school-based strategies instruction, I traveled to sites where such instruction was occurring and talked with the curriculum developers and educators responsible for such programs. I observed strategies instruction in school when possible. I went to the University of Kansas to learn about the Kansas Strategies Instruction Model, a curriculum that had been disseminated nationally by the University of Kansas Learning Disabilities Institute (see Deshler & Schumaker, 1988, for a summary of the evidence validating the Kansas model).

A trip to Michigan State for visits with Gerry Duffy, Laura Roehler, Annemarie Palincsar, Carol Sue Englert, and Taffy Raphael was instructive. Tom Scruggs and Margo Mastropieri welcomed me to their program at Purdue and provided substantial instruction about how some of my basic research on elaboration and mnemonics was being translated into long-term special education curricula (see Mastropieri & Scruggs, 1991). Karen Harris and Steve Graham detailed their instruc-

tional programs with learning disabled students and informed me about how writing strategies instruction can be shaped so that it is effective with mildly handicapped students. Irene Gaskins hosted a visit to Benchmark School so I could observe and discuss the reading strategies instruction offered there. These trips to research sites were complemented by visits to classrooms where teachers struggled to implement ideas that seemed good to them and were based on some exposure to the cognitive strategies instruction literature. These teachers told "war stories" about the challenges of understanding strategies instructions and adapting the approach to the needs of their students using only the resources available to a classroom teacher.

An especially illuminating opportunity came when three counselors from the University of Western Ontario studies skills center enrolled in one of my graduate seminars. Fiona Goodchild, Joan Fleet, and Richard Zajchowski provided me with many hours of conversation about the challenges associated with teaching cognitive strategies to bright and motivated students such as those attending a selective university like Western Ontario.

Pressley, Goodchild et al. (1989) summarized the informal knowledge I had accumulated from the many visits and conversations I had with strategy instruction practitioners between 1987 and 1989. The main theme developed in that article was that effective strategies instruction was not easy; it required demanding forms of teaching such as direct explanation and mental modeling tailored to student needs. These methods require the sensitive and continuous diagnosis of how learners are reacting to explanations. Pressley, Goodchild et al. (1989) made the case that such teaching must be long-term if students are to understand fully when and where the strategies they are learning can be adapted to new situations. They argued that challenges to strategies teaching are aggravated when teachers are already committed to approaches that are inconsistent with good strategies instruction. Sometimes teachers have been exposed to misinformation about cognitive strategies interventions, for example, from published strategies instruction kits produced by authors who are not well informed about the challenges of cognitive strategies instruction, kits in which many strategies are offered for use in a short period of time. Pressley, Goodchild et al. (1989) also acknowledged that much of the best information about strategies instruction was not available to educators because it was published in archival, scholarly journals that are inaccessible to teachers. They concluded that much of the expertise gained by educators as they attempted to implement strategies teaching was not documented at all. By 1989, my colleagues and I were ready to do the documentation and report it in ways that would make sense to educators — and to scientists as well.

Benchmark School Studies

The first studies in this program of research were conducted at Benchmark School in Media, Pennsylvania. Benchmark is dedicated to the education of high-ability students who experience difficulties learning to read in the first two years of schooling. Even though Benchmark students are at great risk for long-term school failure, most emerge after four to seven years at Benchmark well-prepared to return to regular education. Virtually all graduates complete high school, and many attend

college. Because much of the Benchmark approach involves teaching higher level thinking strategies to accomplish reading and other literacy tasks, the school was a perfect place to do an initial investigation of effective strategies instruction.

Irene Gaskins, the founder and director of the school, and I worked on several research projects during the course of my year at Benchmark (1989/90). One was an interview study in which the questions posed were largely inspired by the instructional possibilities I had encountered when visiting the strategies instruction sites that had informed Pressley, Goodchild et al. (1989). The 31 academic teachers at Benchmark were asked 150 questions; each required an objective answer (e.g., a response on a Likert scale) but also permitted additional comments the responding teacher might wish to make. Up to five hours of face-to-face interviews permitted ample opportunity for teachers to provide detailed explanations of what they believed, and why, about strategies instruction based on their extensive experience.

The 31 Benchmark teachers agreed on many points, including the following:

- Direct explanation and modeling are essential components of effective strategies instruction. My observations at Benchmark confirm that such explanations occur during both small- and large-group instruction and as part of one-to-one tutoring and reinstruction. Teachers reported that their initial explanations and modeling are more complete than later ones, although the faculty members, especially the more experienced ones, were emphatic that explanations and modeling should continue for a long time after the introduction of strategies.

- Extensive practice in the use of strategies is essential, as is extensive guidance and feedback in response to students, needs during such practice. Even so, the teachers admitted that it is often difficult to diagnose the problems experienced by students and to devise remedies. The teachers were aware that students did not learn cognitive strategies quickly, but did so easily if given a chance to use strategies across a wide range of tasks and materials, and to practice extensively.

- Strategies teaching and the use of strategies occurred across the curriculum.

- Extensive information must be provided to students about when and where to apply the strategies they learn as well as information about the benefits produced by the use of strategies.

- Transfer of the strategies to new academic tasks and contents is not automatic, but requires extensive teaching about when strategies might be applied as well as practice applying them in a number of situations.

- Only a few strategies should be introduced at a time; in-depth instruction of strategies over months and years is the preferred approach to teaching at Benchmark. Their view was that students develop strategic thinking repertoires over the course of their years in the school — cognitive strategies instruction was not seen as a quick remedy.

- The explicit reinforcement of students' efforts and successes in applying strategies and in accomplishing difficult academic tasks is needed. The teachers thought feedback to students was essential, and positive feedback following success is critical if students are to be motivated. The teachers were well aware that their students had already experienced several years of school failure and believed that their Benchmark successes must be rewarded in order to offset the damage produced by previous failures.

- Developing students who are habitually reflective is an important goal of instruction. Cognitive strategies instruction was seen as a way of accomplishing this higher-order goal.

I was struck by how easy it is to discern broad-based agreement in these interview data. Perhaps the agreement represents an institutional consensus produced by selective hiring and retention, combined with common in-service training at the school. Another possibility is that the consensus represents the collective good sense that emerges when good teachers deal with the challenges of strategies instruction, especially in a school serving students who have academic difficulties. Pressley, Gaskins, Cunicelli et al. (1991) produced data that supported the latter inference.

Pressley, Gaskins, Cunicelli et al. (1991) presented the same questions that had been given to the Benchmark teachers to a sample of nine nationally known researchers in strategies instructions. These distinguished investigators had all had extensive experience in implementing long-term strategies instruction at their home institutions. The congruence in the responses of the Benchmark teachers and this researcher sample was striking, with correlations from .65 to 1.00 between teachers and researchers (depending on the subscale). I concluded was that extensive experience with strategies instruction did produce perceptions of that instruction that are consistent with the perceptions of the Benchmark teachers.

Two additional studies at the school provided even more detailed understanding of how Benchmark teachers do what they do. One was a case study of the use of semantic maps in one Benchmark classroom during spring semester, 1990 (Pressley, Gaskins, Wile, Cunicelli, & Sheridan, 1991). The generation of semantic maps was taught as a way to understand text and included the analyses of text to determine relationships such as cause and effect, temporal sequence, compare and contrast, as well as simple description. Teaching of these strategies was thoroughly integrated with the teaching of content; focal strategies instruction occurred during reading, writing, and social studies as teachers and students interacted to create semantic maps. For example, semantic maps were generated by students as they planned writing assignments as part of social studies. Students' social studies homework often required semantic mapping.

Consistent with the teachers' claims in the large interview study, explanations and modeling of the semantic mapping strategy was more extensive and explicit early in the instruction. After several months, students often began to map the meaning of a text when given a simple one-line direction from the teacher to do so (e.g., "Make a map of what's in this text"). At

this point, teachers only helped students as needed, often giving gentle hints about how specific relationships in a text might be represented in a semantic map.

The instruction of other strategies did not stop when semantic mapping was introduced. Rather, teachers modeled and explained the use of semantic mapping in conjunction with other strategies. For example, the cognitive strategies of activating prior knowledge, predicting, seeking clarification, and summarizing were all prompted frequently during lessons intended primarily to provide new information about semantic mapping as a strategy.

I noted at Benchmark that cognitive strategies were being taught as ways to encourage individual interpretations. For example, teachers in the Pressley, Gaskins, Wile et al. (1991) case study taught their students that no two semantic maps should be alike and that each student's map should reflect individual reactions to the content of the text.

Interpretive activities were especially apparent in the analyses of Benchmark classroom dialogues produced by Gaskins, Anderson, Pressley, Cunicelli, and Satlow (1993) who studied the strategy instruction lessons of six teachers at Benchmark. The discourse in these classrooms was very different from the discourse in conventional classrooms. Cazden (1988) and Mehan (1979) observed that typical classroom discourse includes many cycles of a teacher asking a question, a student responding, and the teacher evaluating the response (IRE cycles: [teacher] initiation, [student] response, and [teacher] evaluation). IRE cycles were not found in the Benchmark data, however. Instead, the teachers engaged in interactive dialogues with their students 88% of the time in what Gaskins et al. (1993) called process-content cycles. The teacher used content as a vehicle to stimulate the application and discussion of strategies.

When students make comments in discussions, Benchmark teachers do not attempt to evaluate their responses but rather encourage the students to elaborate on them — encouraging students to process the content additionally using strategies. The goal is to encourage students' understanding of content through strategic processing. Thus, a teacher might request that a student summarize a passage. Once the summary is offered, the teacher might ask the student to describe any images that came to mind while reading the text or encourage the student to liven up the summary by relating the text content to prior knowledge (e.g., When you visualize how a third-class lever works, where do you see the fulcrum? How is that picture different from what you visualized when the author described first- and second-class levers? Can you tell about an occasion when you have used a third-class lever? How did this simple machine benefit you?).

An important finding in the Gaskins et al. (1993) investigation was the identification of events that occur often in lessons:

- Students are provided instruction about how to carry out the strategies.
- Teachers model the focal strategies (and sometimes use of other strategies as well).
- Students practice strategies, with teacher guidance and assistance provided as needed.

- The focal strategy for a lesson and the focal curriculum content for the day are identified for students early in the lesson.

- Information is presented about why the focal strategy (and sometimes nonfocal strategies as well) is important. Often teachers provide anecdotal information about how strategies have helped them.

- Information about when and where strategies apply is conveyed to students.

The Benchmark studies were satisfying to me as a researcher. When teachers were interviewed, when they were observed, and when their discourse was analyzed their ways of explaining strategies and then following up with student practice were apparent. The practice was guided and assisted by teachers who carefully monitored students' attempts to use strategies, offering help when needed. Elementary content coverage was not displaced in favor of strategies instruction but rather, strategies were applied as students learned elementary content. The outcomes of the Benchmark investigations are congruent with the outcomes of the studies conducted in the Montgomery County, Maryland, schools.

Montgomery County, Maryland, Strategies Instruction Programs

Ted Schuder, Jan Bergman, and Marcia York, all working as curriculum developers for the Montgomery County schools, developed and deployed several strategies-based programs aimed principally at encouraging reading comprehension. My colleagues and I focused on two of these programs, one called SAIL (Students Achieving Independent Learning), which was designed for implementation across the elementary years beginning with primary reading. The second program, SIA (Summer Institute for Achievement) was a summer school program emphasizing similar strategic processes and methods of teaching. The strategies highlighted in SAIL are ones validated in the research of the 1970s and 1980s: prediction of content based on picture, title, and text cues; evaluation of predictions and updating of expectations as reading of text proceeds; generation of questions in response to text; production of aesthetic responses to text (including personal evaluations and interpretations); summarization; clarification; visualization; and selective attention to important and interesting parts of text.

SAIL and SIA instruction occurs around high-quality texts, often in reading groups small enough to encourage exchanges among all students about interpretations of text, imaginal reactions to content, and summaries. When strategies are introduced initially, for example in first or second grade, lessons often focus on individual strategies. There may be several weeks in which students make prediction after prediction, followed by weeks of practicing visualization. Once students are familiar with the strategies, the lessons emphasize the coordinated use of strategies. A great deal of teacher prompting is required for this to happen, and the need for substantial prompting continues for months and perhaps years. Eventually (e.g., in the third year of SAIL instruction), students meet in groups and carry out strategic processes in a self-directed fashion — that is, teacher prompting and cuing is much less

pronounced than it had been in previous years. El-Dinary, Pressley, and Schuder (1992; Pressley, El-Dinary, Gaskins, et al., 1992) have observed a number of common activities in SAIL and SIA lessons:

- Students are provided instruction about how to carry out the strategies emphasized in curriculum. Usually this is re-explanation of strategic processes somewhat familiar to the students, amounting to a recasting of the strategies in new terms.
- Teachers model use of the SAIL/SIA strategies.
- Students practice strategies, with teachers helping as needed. Often prompts are in the form of questions suggesting additional strategic processing or possible ways to extend or expand an interpretation.
- Information is presented about why the focal strategies (and sometimes nonfocal strategies as well) are important. Often teachers provide anecdotal information about how strategies have helped them.
- Students are often required to model and explain the use of the SAIL/SIA strategies.
- Information about when and where strategies apply is conveyed to students. The positive effects of strategies are continuously pointed out to students.
- Sophisticated processing vocabulary (e.g., terms like "predictions," "clarifications," "validation of predictions," and "summaries") are used frequently.
- Flexibility in strategy use is apparent, with teachers emphasizing how different students might apply strategies in different ways to the same content.
- Teachers send the message that students' thought processes matter.

Of course, these behaviors were apparent at Benchmark as well. Both settings had developed strategies instruction involving a great deal of direct explanation and modeling, consistent with the claims in Pressley, Goodchild et al. (1989) about the nature of effective strategies instruction. At Benchmark and in Montgomery County, students and teachers talked about their thinking processes. They shared their interpretations of texts in an open and relaxed group context. Coordination of strategies was emphasized in both programs; both provided years of practice in such coordination.

In these two settings, educators with years of field experience were aware of the comprehension strategies research literature. They selected the strategies and methods from that literature that made the most sense to them in light of their years of experience as educators. They were particularly impressed with the work of Gerald Duffy and his associates (e.g., Duffy et al., 1987, 1988) on direct explanation of strategic processes. Indeed, I would say that Duffy's perspective on direct explanation — including mental modeling and subsequent guided practice of students — is the most influential perspective to date on how to teach strategic processes in classrooms. It is also consistent with the method of strategies teaching in some of the most influential basic research studies relating to strategies (see Pres-

sley, Snyder, & Cariglia-Bull, 1987, for an analysis).

Explaining strategies to students, showing them how to use strategies, and helping them as they attempt to apply strategies as part of in-school practice seems sensible to many teachers. Although the explanation of strategies, modeling, and guided practice of strategies were all studied in the basic research literature, transactional strategies instruction goes well beyond anything presented in the literature. The transactional strategies instruction described here evolved as teachers worked with it. Credit the educators more for this intervention than the researchers, although basic research provided the impetus and guidance for initial efforts, as well as information about which strategies might be worth teaching.

Often applications are not theoretically interesting; that is not so with respect to transactional strategies instruction. The studies reported here have provided many new theoretical insights about the nature of cognitive strategies instruction at its best — including its transactional nature, relation to effective instruction in general, and constructivist features.

THEORETICAL INTERPRETATION I: TRANSACTIONAL NATURE OF STRATEGIES INSTRUCTION

What an instructional approach is called is critical. Well-known educational interventions usually have memorable names that capture an important characteristic of the intervention succinctly (e.g., reciprocal teaching, cooperative learning, criterion-referenced instruction). One possibility was simply to use Duffy's preferred term "direct explanation." I did not do that for two reasons: First, the term sometimes evokes the behavioristic conception of effective teaching known as "direct instruction" (e.g., Rosenshine, 1979). Since even hints of behaviorism are not received well in the cognitive and constructivist circles I frequent, direct explanation did not seem right. Second, the term focuses on the teaching behaviors rather than on what happens between teachers and students and in the minds of the teachers and students. I wanted a summary term that reflected the dynamic give-and-take between teachers and students that is typical of the effective strategies instruction I had witnessed.

The descriptive label "transactional strategies instruction" seemed appropriate because of Louise Rosenblatt's (e.g., 1978) classical analyses of text interpretations as products of reader/text transactions. Rosenblatt said that meaning is not in text alone or in the reader's head alone but is constructed by readers as they consider text content in light of their previous knowledge and experience. Such meaning construction was certainly emphasized in the instruction I was watching; students were encouraged to use strategies such as prediction, visualization, and summarization to create personalized interpretations and understandings of text.

The term "transactional" is appropriate for other reasons as well, however. In the developmental psychology literature (e.g., Bell, 1968), that term is used to refer to child/adult interactions in which the child partially determines the behaviors of others in the child's world. Thus, a child who is sanctioned by a parent can control the parent's next behavior by his or her reaction to the sanction, with immediate deference to the parent likely to result in a cessation of punishment and immediate defiance likely to

result in additional and more severe reactions from the parent. Analogously, teachers' reactions are determined largely by the reactions of the students at Benchmark and in the SAIL and SIA programs. Teachers react to student interpretations and student difficulties. If a student offers a good summary, the teacher may prompt elaboration of the summary; if the student's summary is poor, the teacher may prompt rereading or reconsideration of the text. What happens in transactional strategies instructional groups is determined largely by the reactions of students to teachers and to other students.

The strategies instruction I have been studying is transactional in yet a third sense. Organizational psychologists (e.g., Hutchins, 1991) in particular have been concerned with the types of solutions produced during group problem solving compared to individual problem solving. Groups invariably produce solutions that no one person in the group would have produced. Groups also produce memories that would never have occurred to individuals unless they had participated in the group (e.g., Wegner, 1987). There is a transactive mind when individuals get together to think about things. So it is with the strategies instructional groups we have been studying; ideas about text emerge as one student's elaboration of content stimulates another child's elaboration of the same text.

Thus, there are three senses in which the classroom strategies instruction I have documented is transactional: (a) Meaning is determined by minds applying strategies to text content. (b) How one person reacts is largely determined by what other participants in the group are doing, thinking, and saying. (c) The meaning that emerges is the result of the efforts of everyone in the group. Such instruction is transactional in all of these senses because what goes on during strategies instruction is extremely intelligent assistance by teachers of students.

THEORETICAL INTERPRETATION II: INTELLIGENT ASSISTANCE THEORY

The term "intelligent assistant systems" has been coined in the cognitive science literature with respect to machine systems that can assist people in performing complicated tasks (e.g., Boy, 1991). The goal of workers in this area of artificial intelligence is to produce something like C3PO and R2D2, the robots in *Star Wars*, although the technology is far from the point of producing machines with the intellectual sensitivities of the *Star Wars'* androids. Nonetheless, this movement in artificial intelligence has produced sophisticated models of what occurs when any intelligent entity gives assistance to another entity. A brief consideration of four of the most important ideas in intelligent assistance will make clear that strategies teaching by human teachers to human students is simply one instance of intelligent assistance. These analyses will also shed more light on the complicated nature of such assistance.

Automatic, Situated Knowledge of Strategies Possessed By Intelligent Assistants Versus The Knowledge of Cognitive Strategies That Must Be Conveyed to Novices

Comprehension strategies instruction teachers are often very good readers. They know a variety of strategies — in cognitive science

terms they have procedural knowledge — and are facile at the coordinated use of these strategies in conjunction with factual (declarative) knowledge (e.g., Anderson, 1983). They can use comprehension procedures automatically and recognize situations immediately that call for the strategies they are using. There is no need for reflection about what to do when they are reading; they simply do it (see Flower et al., 1990, for discussion of highly skilled reading and writing in these terms). Such automaticity and situational knowledge is built up through years of practice and experience.

Paradoxically, such facility in strategies use can make strategies teaching difficult. To use a computer programming analogy, such a strategy expert must "decompile" his or her knowledge of comprehension processing in order to teach beginning readers — modeling the execution of strategies in a step-by-step fashion rather than as a rapid, continuous sequence of events. In the strategies instruction programs I have studied, teachers are provided decompiled information by the program curriculum developers about what young readers can do to understand better. Thus, the automatic comprehension processes of good readers are broken down into simple descriptions of processes such as predicting, relating to prior knowledge, clarifying, generating questions, problem solving, and summarizing.

At first, teachers encourage execution of these strategies one at a time; students carry them out slowly. The assumption is that with a great deal of teacher-cued practice during reading, automatic execution of the processes will develop, as will the situational knowledge permitting students to recognize points during reading that call for each of the strategic processes. With the development of automaticity and situational knowledge, strategy use becomes more flexible. For example, the situational knowledge that develops is not a rigid set of rules but rather general notions about when to be active during reading and in what ways to be active. The irony is that the initial teaching must be directed at the reflective, deliberate use of strategic procedures (in computer science terminology, procedures not yet compiled), even though the long-term goal is automatic, nonreflective comprehension processing that resembles the processes specified by the strategy formulae but is much faster and varied (compiled knowledge) than the strategy attempts of novices.

Intelligent Assistant Diagnosis of Difficulties Experienced By Persons Being Assisted

Workers in machine intelligent assistance are painfully aware of the problem of diagnosing the needs of those receiving assistance. For example, intelligent assistance devices in cockpits must be able to recognize pilot errors and their significance and provide information about how to correct such problems. Although some systems can recognize a limited number of problems (e.g., when a plane is headed straight for a mountain) and can provide a limited repertoire of directives (e.g., a voice command to, "Pull up," as the mountain approaches), artificial intelligence is a long way from producing a robotic copilot who approaches the competence of an experienced human copilot.

An especially great challenge for computer scientists is to figure out how to build machines that can accumulate knowledge of the types of

errors made by those being assisted and the responses from the machine that produce improved performance. The development of such knowledge is especially challenging because it is nonspecific knowledge. The error committed by a person receiving assistance today can at a deep level be the same error committed by another person tomorrow, although the two errors may appear to be very different because of different surface features. Thus, the system must be able to recognize the deep structural similarities between the difficulties being experienced by those being assisted and difficulties detected and corrected previously.

Analogous problems of diagnosis and the development of expertise in correcting errors exist with respect to strategies instruction. Strategies teachers must be able to evaluate student needs. This can be challenging as it requires a great deal of knowledge beyond knowledge of the strategies. Only through years of experience with students can teachers build up a sophisticated understanding of student problems and appropriate reactions to those problems. A challenge for educational scientists is to determine how best to develop such knowledge in teachers, although it seems almost certain that years of teaching experience is going to be required for expert diagnostic teaching to develop (see Chi, Glaser, & Farr, 1988).

Communication Breakdowns and Miscommunications During Intelligently Assisted Instruction

The analyses of intelligent assistance in cognitive science help explain why the information provided by teachers often seems to miss the mark, and why many redundant explanations are sometimes required to get important ideas across about strategies and their use (e.g., Ellis, 1989). Suppose a child in a reading group hears how to apply summarization to a particular type of text. What can go wrong? (See Chapter 9 of Boy, 1991.) The instruction might not be complete enough for the child to understand it. There may be ambiguities because of a mismatch between the knowledge of the teacher and that of the child. Unfortunately, some explanations teachers offer in the middle of a story are simply incoherent. Sometimes the explanation of the strategy is fine, but does not apply in the current situation. For example, suggesting that a student relate what he or she already knows about a topic when in fact the child knows very little about the topic would be unproductive. The analyses of intelligent assistance have made clear that the assistance message is only sometimes helpful. Having witnessed many teacher explanations that did nothing for the student, I know that this problem in the world of machine/human interactions is every bit as keen with respect to instructional encounters of the strictly human kind.

Perception of Questions By the Intelligent Assistant

In order to understand questions posed by those needing assistance, intelligent assistance devices must have "beliefs" about the people they are helping (Maida & Deng, 1989). So must human teachers (Bowers & Flinders, 1990). The question Why? following a teacher's explanation of a strategy can be construed

to mean Why use this strategy — what immediate goal does it fulfill? or Why use this strategy — what long-term goal does it fulfill? or Why would you do it that way rather than another way? (e.g., Cooke, 1989; Hayes-Roth, Waterman, & Lenat, 1983). These beliefs also affect what is said in response (e.g., an answer requiring high or low prior knowledge), how to say it (e.g., with advanced or simple vocabulary), and how much to say about it (e.g., with the detail of a technical manual or an owner's manual) (Weiner, 1989). The intelligent assistant must determine whether a short answer is sufficient in light of the intelligent assistant's perception of the importance of the question, or whether a longer answer is critical since the person being helped seems to have fundamental misunderstandings. Determining how to build machines that can do this is a critical part of research on machine intelligence. It is also critical to the development of excellent teachers, in part because answers to questions cannot exceed the learner's total mental resources — including his or her attention span (short-term memory).

Sensitivity to Capacity Limitations of Those Being Assisted

Any help that comes from an intelligent assistant cannot be too complicated. Human beings have limited short-term memory capacity. When humans need help with something, their capacity is often already stretched to the limit. Consider a situation in which a first-grade teacher is the intelligent assistant. When Robbie is having difficulty sounding out a word, for example, "Frog," a great deal of Robbie's limited attention is devoted to the task (LaBerge & Samuels, 1974). That is, humans can only attend to a few things at once, and if they are attending to something very difficult, there is little attentional capacity (sometimes known as short-term memory capacity, sometimes known as consciousness) left over to attend to other things. Thus, assistance such as, "Remember 'f' sounds like f-f-i and 'r' sounds like r-r-r and when they are blended, they sound like _____" probably would not be effective because Robbie would not be able to attend to it and work away at the word at the same time. Prompts that demand less short-term capacity would work better, so a hint like "What would you already know that has the same vowel sound — that has 'o-g' in it?" might be more helpful. Experts in intelligent assistance are always attempting to devise simple cues that prompt desired actions. Thus, some rapid transit systems have developed computer-controlled oral directions that are automatically broadcast over speaker systems when there is trouble on a train. These messages are simple, which is necessary because the anxiety and confusion of a train emergency consume cognitive capacity. One such message is, "Get out of the train!!"

Summary

Helping a person perform a cognitive task or learn a cognitive skill is challenging, whether the helper is a computer or a human teacher. The analysis in this section suggests that it is not nearly enough for the intelligent assistant to know how to do something, the intelligent assistant must also know how to communicate the process in question to novices. This involves being able to slow down a process and

discuss it in a step-by-step fashion. These explanations must be formulated to accommodate learner limitations. For example, they should not be so long or complicated that the message demands more short-term capacity than the student has. The intelligent assistant can also re-explain processing so that students who do not get it the first time might be able to get it with additional explanation. Part of the ability to re-explain is the ability to discern the specific difficulties a student experiences, including the meanings of questions that the student might pose.

This analysis complements the earlier discussion by establishing that while effective strategies instruction includes processes such as direct explanation, modeling, and guided practice, knowing these is not enough to understand the sophistication of effective strategies instruction. During the last two years, El-Dinary and Schuder (1993; also El-Dinary et al., 1992) studied teachers who were using strategies instruction for the first time. It was rough going. Even those teachers who quickly understood that they had to model and explain and guide practice often experienced difficulties doing it. They could not rephrase strategies explanations fluidly; they could not understand why some students might be faltering. Intelligent assistance theory provides a framework for understanding such difficulties.

One paradox is that theoretical analyses emerging from models of machine learning do not lead to a mechanistic conception of strategies instruction. The analysis presented in this section makes clear that strategies instruction is not a "pouring" of information from the teacher to the student but rather involves intelligent assistance in constructing an understanding of strategies and their applications. Thus, the theoretical analyses presented in this section set the stage for an expanded discussion of the constructivist nature of strategies instruction.

THEORETICAL INTERPRETATION III: THE CONSTRUCTIVISTIC NATURE OF STRATEGIES

One criticism of strategies instruction (e.g., Poplin, 1988a, 1988b) is that it is mechanical and encourages rote responding. Students are portrayed as being taught to execute strategies in a rigid fashion. Karen Harris, Marilyn Marks, and I (Harris & Pressley, 1991; Pressley, Harris, & Marks, 1992) recently confronted these claims, making the case that good strategies instruction does anything but encourage rote passivity. Good strategies instruction invites the creative and flexible construction and use of strategies by students — clearly a constructivist approach.

Analysis of strategies teaching according to Moshman's (1982) three types of constructivism is helpful in understanding how some strategies instruction is constructivist: (a) *Endogenous constructivist* teaching, based largely on Piagetian theory, mostly involves child- determined exploration and discovery rather than direct instruction. (b) *Exogenous constructivist teaching* emphasizes explicit teaching much more than does endogenous constructivism. For example, the modeling and explaining that makes up teaching according to social learning models (e.g., Bandura, 1986; Zimmerman & Schunk, 1989) certainly involves exogenous constructivism. The learning that occurs is not rote, however, but involves personalized understandings and interpretations

of content. Students discover a great deal as they grapple to understand the explanations provided to them and to act like the models they have observed. Thus students' understandings of the content they are learning are different from the understandings their teachers have.

(c) *Dialectical constructivist teaching* is especially favored by those who identify themselves as constructivists. This form of teaching lies in between endogenous and exogenous constructivist teaching. Those using this approach recognize that students left to discover on their own will learn inefficiently at best; even so, dialectical constructivists are uncomfortable with teaching as explicit as that favored by exogenous constructivists. Dialectical constructivists like to provide hints and prompts to students rather than large doses of direct explanation and modeling (although some explanations and modeling are used). Dialectical constructivists favor providing just enough support so that students can proceed with a task or learn a new skill. The idea is that by interacting with an adult who gently prompts and guides efficient processing, the child will eventually internalize such processing operations, an idea consistent with Vygotsky's (1978; also Wood, Bruner, & Ross, 1976) theory of the socially-mediated development of cognitive competence. Pressley, Snyder, and Cariglia-Bull (1987) characterized dialectically constructivist instructional interactions that presumably produce long-term commitment to and use of approaches to processing:

> Mature thought develops in social contexts. Children first experience sophisticated processing in interpersonal situations, with more mature thinkers modeling good thinking and guiding young children's problem solving, often by providing cues to assist the children when they cannot manage on their own. The adults provide what has been referred to as proleptic instruction (i.e., instruction that typifies the child's needs). Adults direct children's attention appropriately; they provide strategies to children; in general, they serve a supervisory role, making their own good processing as visible as possible. They also try to guide the child to process in the same efficient fashion (e.g., Brown & Ferrara, 1985; Childs & Greenfield, 1980; Day, 1983; Greenfield, 1984; Palincsar & Brown, 1984; Vygotsky, 1978; Wertsch, 1985; Wood et al., 1976). Eventually children adopt as their own the thought processes that adults have externalized for them and encouraged them to use. They internalize the mature processing they have witnessed and participated in, although the internalized version is not an exact copy of the external processing. The explicit, heavily verbal processing that characterizes the adult-child interactions becomes abbreviated and highly efficient as it becomes intrapsychological functioning (Vygotsky, 1962, p. 102).

I now take up three characteristics of effective strategies instruction that show such instruction to be constructivist. (See Pressley, Harris, & Marks, 1992, for a longer list.) Each of these characteristics contrasts with claims about strategies instruction made by some critics of strategies instruction.

Strategies Teaching Accomplishes Whole Tasks

Some critics believe that strategies instruction breaks tasks down into parts rather than dealing with wholes and that it resembles skill teaching rather than education. That is not true for the cognitive strategies instruction considered in this perspective; it involves teaching children how to tackle whole texts. Similarly, contemporary writing strategies instruction is aimed at the creation of whole texts. Good problem-solving strategies instruction is aimed at teaching students to resolve challenging problems.

Complex tasks involve a number of processes used in a coordinated fashion. For example, reading comprehension includes generating expectations, relating text meaning to prior knowledge, seeking clarification when confused, visualizing, and summarizing. Effective strategies instruction encourages the use of the many processes required to complete ambitious tasks. I have not been watching lessons in which students do text prediction drills or visualization drills, or any other type of drills out of the context of real reading. The instruction I have been watching for years occurs while students are reading entire stories and entire books. Students are encouraged to apply a developing repertoire of procedures as part of constructing a rich and personalized understanding of stories and expositions they hear and read.

Errors Are Important During Strategies Instruction

Some behavioristic models of teaching focus only on correct performance and view errors as something to be extinguished. In contrast, constructivists view errors as revelations about student understanding and opportunities for cognitive growth. So it is with effective strategies instruction. Errors during strategies learning permit diagnosis of difficulties as students struggle to understand and apply strategies; the errors a student commits can reveal the student's understanding of the strategies being taught. The teacher can then craft instruction to clarify the desired strategic processing.

Errors during strategies learning can also show the student the value of strategies learning. Good strategies instruction includes reflection on how performance is improving as a function of learning strategies; students are often asked to explain why their strategies-mediated performances are getting better. (See Schank and Leake [1989] for a discussion of the power of creating such explanations in promoting the construction of powerful thinking competencies.)

What Is Learned From Strategies Instruction Depends in Part on What the Student Already Knows

Constructivists believe that developmental level, interest, and prior knowledge are determinants of what students learn during any instructional interaction. An extreme example is the traditional Piagetian (see Flavell, 1963) notion that developmental stages determine when a concept can be acquired. A second example is schema theory (e.g., Anderson & Pearson, 1984), with its assumption that material is easier to learn if it is consistent with knowledge already possessed by the learner. For example, it is easier for a four-year-old to

understand what to do at Pizza Hut if the child has previous knowledge of the routines in other sit-down restaurants.

Strategies instructors are also aware of student characteristics; this awareness is translated into consistent monitoring of whether students are learning from instruction. When instruction is not successful, strategies instructors try to discern how instruction might be restructured and represented so that learner needs are accommodated.

Summary

Pressley, Harris, and Marks (1992) summarized the nature of constructivist instruction, based on a review of programs that are identified by many as constructivist instruction (e.g., Pontecorvo & Zucchermaglio's [1990] literacy learning curriculum; instruction at Kamehameha School [Tharpe & Gallimore, 1988]; Pettito's [e.g., 1985] mathematics instruction). Constructivist instruction has the following characteristics:

- Modeling and giving explanations are aimed at promoting greater competence in students, not by the simple emulating of skills but by students' creative adaptation and personalization of the skills being taught.
- Instruction is more explicit on some occasions than on others. The explicitness of prompting is determined in part by whether or not students react successfully to instruction (i.e., less prompting, instruction, and reinstruction when things are going well).
- The student constructs knowledge in interaction with a more competent adult. Much of this knowledge construction occurs as the student practices applying the skills modeled and explained, assisted by an adult who intervenes when the student needs assistance but not otherwise.
- Dialogues between teachers and students are not scripted. Adult reactions to students are somewhat opportunistic, providing feedback and instruction matched to need as students attempt to write, read, speak, or solve problems.
- Sometimes these interactions go smoothly; other times there are difficulties. The nature of the difficulties can be used to adjust subsequent instruction.
- There is an emphasis on learning through understanding.
- Instruction occurs in groups in which students provide feedback to their peers.
- The adult continuously assesses the child's competence, assuming that current competence determines what the child will be able to learn.
- Constructivist teachers encourage their students to apply what they are learning to new tasks.
- There are individual differences in rates of progress.

All of these characteristics of constructivist instruction are also characteristics of effective

thinking strategies instruction. The difference between the instruction given by those who prefer the label "constructivist educator" and those who embrace the term "strategies instructor" is in the explicitness of the statement, modeling, and explanation of strategies. Good cognitive strategies instruction is probably more explicit in detailing for students the procedures and processes they are being taught than is instruction identified as constructivist. The more the instruction is endogenously constructivist, the less it resembles good strategies instruction. Both exogenous and dialectical constructivist positions share many characteristics with good strategies instruction. No good strategies instructor can ever completely specify a strategy or strategies for students. Students are expected to fill in gaps in information provided about strategies, adapt the strategies they are learning, and use the strategies on new tasks. What the good strategies instructor does is to provide beginning information about strategies. Good strategies instruction is a specific instance of providing students with "the 'material' upon which constructive mental processes will work" (Resnick, 1987, p. 47).

FUTURE RESEARCH ON TRANSACTIONAL STRATEGIES INSTRUCTION

My colleagues and I continue to work on transactional strategies instruction. Three directions for future research, all informed by our ongoing qualitative research, will be discussed in this section.

Better Instruction at the Primary Level

As part of Pressley, Schuder, SAIL Faculty and Administration, Bergman, and El-Dinary (1992), I held focus-group discussions with SAIL teachers to identify benefits and problems with the program. Then, I watched hours of such strategies instruction, followed by informal interviews with teachers about the strengths of the program and the potential weaknesses. Finally, I prepared a formal questionnaire, which was administered to 14 teachers in the SAIL program who first had answered in written form. We had a face-to-face interview to permit the teachers to expand on their answers and offer insights that might not have come through in their written responses.

The SAIL teachers perceived many more strengths than weaknesses with the program. They believed that many aspects of literacy have been improved by SAIL, including oral reading, comprehension, student understanding that comprehension is under student control, writing, higher-order thinking, use of background knowledge to interpret texts, attention to meaning of texts, intertextual comparisons by students, involvement in reading groups, and student excitement about reading. The teachers also perceived that academic self-concepts and self-esteem had improved since SAIL began and that social interactions during reading were better. The teachers also felt that SAIL was compatible with whole language, which is critical, since the whole-language approach is the umbrella curriculum philosophy for Montgomery County schools.

Even so, there were some concerns about the comprehension strategies instruction that defines the SAIL program, especially at the primary level. Teachers of nonreaders felt that the intervention made no provision for teaching of decoding and that hard thinking must be done to determine how SAIL could be meshed with decoding instruction. Primary teachers also felt that it was difficult to identify grade-1 stories that were complicated enough to justify

the SAIL strategies. These insights from the enthnographic interview study provided the impetus for change of the program during 1991/92.

Pamela Beard El-Dinary and I set out to study what might happen if SAIL primary teachers tried to integrate SAIL and conventional decoding instruction, and if they were assured that it was all right to use the method more flexibly than had been suggested in previous years. One tangible form of support was provision of a decoding-oriented basal program to the teachers (*Open Court Reading and Writing*), which teachers were free to use as part of their reading instruction. (Primary teachers in the 1990/91 SAIL program had reviewed this program and believed it could be meshed with SAIL.) Four of the five first-grade teachers who were studied in 1991/92 used Open Court materials; the fifth teacher adapted materials from various reading series in order to provide phonics instruction to her students. Weaker readers received more phonics instruction during 1991/92 SAIL than they had in previous years of the program.

As in previous years, the grade-1 SAIL lessons were designed to familiarize students with the strategic processes encouraged in SAIL. Students received repeated explanations of the SAIL strategies and many lessons involving a heavy emphasis on one or two of SAIL's cognitive processes. In previous years, SAIL was used almost exclusively in the context of reading. In 1991/92, Pamela and I noted its predominant use as part of *listening* comprehension. First-grade students can listen to and comprehend much more complicated stories than they can read, so using SAIL as part of listening comprehension in first grade seems sensible and circumvents the difficulty of identifying grade-1 stories appropriate for SAIL processes.

Two primary-grades SAIL teachers, Maryrose Pioli (grade-1) and Kathy Green (grade-2) taught a class including many second-grade students with decoding difficulties. They provide insight into the importance of meshing decoding and SAIL comprehension instruction:

MRP: Decoding skills help the grade-1 students become independent readers in the sense they can at least read the text without stumbling over individual words. By combining high-quality decoding instruction with SAIL comprehension instruction, the grade-1 students experience a lot of success in reading quickly. What is especially important is that the two approaches used together permit students to read more on their own with confidence.

KG: Decoding instruction goes a little slowly at first and more time with real literature might be ideal. But when the goal is to independently decode stories, explicit decoding instruction cannot be beat. I used a motivating approach to decoding which was not at all aversive for the students. Once they were decoding well, it was natural and easy to get started with the SAIL comprehension strategies.

These same teachers also saw the advantage of introducing SAIL strategies gradually, with listening comprehension playing an important role in primary-grades strategies instruction:

MRP: When I read aloud and modeled the use of strategies, my grade-1 students could begin to identify the strategies I was using as I read. That is a good introduction to strategies.

KG: My oral reading of stories gets the students to listen to each other — I ask them to help me, with suggestions for strategic processing of the story. Students help come up with predictions, suggest vivid images, and assist in construction of story summaries. From hearing each others' predictions, images, and summaries, the students come to realize that there is not one right prediction or visualization or summarization but many, depending on their background knowledge. The students acquire a good understanding of these strategic processes before having to apply them to actual reading.

In summary, progress has been made in understanding how to improve one transactional strategies program, SAIL, at the primary level. The teachers themselves received very little outside help in revising this cognitive strategies curriculum. The progress already made in understanding how to conduct comprehension strategies instruction at the primary level increases my optimism that systematic comprehension instruction can be devised for use at the primary level. More research and development is required for three reasons: (a) There is little guidance in the basic research literature with respect to teaching comprehension strategies to students in the first two grades. (b) The whole-language philosophy that now predominates in early reading instruction emphasizes comprehension. (c) My colleagues and I have observed that primary children do seem able to predict, seek clarifications, summarize, and visualize as they listen to stories in groups, and they seem to like doing it. Instruction rich in such comprehension processes is likely to be much more engaging for students than the skills-oriented instruction that has predominated primary-grade instruction in the past. The development of reading instruction that promotes student engagement in literacy is and should be a high priority (Guthrie, Alvermann, et al., 1992).

Teacher Development

In the first interview study of transactional strategies instruction conducted at Benchmark School (Pressley, Gaskins, Cunicelli, et al., 1991), the teachers told us tales about how difficult strategies teaching had been during their first year. Similar sentiments were conveyed by SAIL teachers when they were questioned about their experiences in learning how to be strategies teachers (Pressley, Schuder, et al., 1992). No transactional strategies instruction teacher has ever told me that the first year was easy.

Pamela El-Dinary and I (El-Dinary et al., 1992) have studied first-year SAIL teachers for the last two years, watching and talking with them as they have attempted to teach their students the SAIL processes. The teachers were introduced to SAIL through professional development in-service meetings supplemented by observations of teaching. The teachers received limited feedback as they taught reading groups according to the SAIL model.

Three teachers were studied in 1990/91 and four in 1991/92. In the first year, one of the three teachers made a clear commitment to SAIL and progressed well; in the second year, two of the teachers did the same. That is, less

than half of the teachers were committed to SAIL after a year and were teaching in a fashion generally consistent with the model. The other teachers either did not "buy into SAIL" or if they did, they could not implement SAIL effectively on a regular basis in their curriculum. None of the teachers felt totally comfortable with SAIL after their first year; all felt there was quite a bit yet to learn.

All of the reports I have heard about learning to be a strategies instruction teacher and the struggles my students and I have witnessed convince me that research must to be done on how best to prepare teachers to teach strategies. There is so much to learn and not nearly enough information conveyed in faculty development workshops (although, see Anderson & Roit, in press, for some data on effective workshops they have been studying). Enormous effort is required for teachers to become good at modeling and explaining strategies as they cope with many other demands in their curricula.

I am optimistic that many strategies instruction teachers can be trained, for there are already successful efforts to do so. For example, Deshler, Schumaker, and their colleagues at Kansas (e.g., Deshler & Schumaker, 1988) have trained thousands of teachers in the implementation of the Kansas strategies instruction curriculum. Gerald Duffy has educated a number of teachers at Michigan State to be strategy instructors. Irene Gaskins has developed an entire faculty at Benchmark School. In each of these cases, however, teacher training was long-term and involved extensive practice and feedback. Indeed, a likely hypothesis is that, like many complex skills, transactional strategies instruction teachers will continue to improve their teaching of strategies for many years following introduction to the approach (see Brown & Coy-Ogan, 1993). Research on teacher development must be a priority during the next few years if effective strategies instruction is to be widely disseminated.

Strategies Across the Curricula and School Day

Any single transactional strategies instructional intervention that is now being invented will operate as part of an overall curriculum. For example, reading strategies instruction at Benchmark School and in Montgomery County Maryland both occur in conjunction with writing strategies instruction and process-oriented mathematics instruction. The reading and language arts curricula also reflect whole-language influences. There is no single cognitive process instruction predominating here; rather, a repertoire of strategies, many of which can be applied in different ways throughout the school day. It is exciting when such integration occurs, as when expository text analysis strategies are turned around by students and used to plan for the writing of essays; this happened during my semester case study at Benchmark (Pressley, Gaskins, Wile, et al., 1991). SAIL students sometimes transfer visualization strategies from reading to mathematics. I spent many mornings in Montgomery County and Benchmark classrooms when strategies were applied throughout the morning.

Sadly, however, integration is rare. Many teachers teach strategies like separate skills. Many who offer in-service strategies instruction as well as strategies instructions in basal manuals assume that if the separate strategies

are practiced and mastered, somehow the students will get it all together. I have no such faith. I believe that strategic cognitive activity as a typical way of writing, reading, or problem solving will be most likely to develop for the largest number of children if school environments foster intelligent activity throughout the day. The refined understandings that have emerged about how to teach writing, reading, and problem solving strategically (see Pressley & Associates, 1990) must be meshed in real schools settings.

Educators, rather than researchers, must take the lead in creating whole schools that foster strategic competence. Researchers' talents are better matched to documenting what occurs in such environments, and to developing summaries of such instruction that can be comprehended by other educators and researchers. That is what my colleagues and I did with respect to the transactional strategies instruction summarized here.

SUMMARY AND CONCLUDING REMARKS

Experimental investigations of reading comprehension strategies provided a great deal of valuable information. Particularly relevant here, the experimental and basic research literatures informed the Benchmark and Montgomery County SAIL curriculum developers about cognitive strategies that might be taught to elementary students. These educators combined what they learned from the research-based literature with their well-grounded understandings of classrooms to design strategies-based interventions. In trying to implement these interventions, teachers discovered what worked and what did not work and how to teach thinking strategies so that students would "get it."

The good strategies instruction teachers I met several years ago seem better today. I expect there are many refinements to come as educators gain greater experience with strategies instruction and intermix it with ever-changing curricular demands. For example, there is now tremendous impetus to expand the SAIL program into all content areas because of the emphasis on strategies and strategic thinking in the new state assessment.

My colleagues and I have documented how good strategies instruction is carried out in two settings. The basis of the instruction we observed is modeling and the direct explanation of cognitive strategies, followed by teacher guidance and assistance as students attempt to apply the thinking strategies to real academic tasks. Effective strategies instruction is a multiple-year enterprise (see Pressley, Faculty and Administration of Summit Hall School, et al., 1994), and there are many "wrinkles" to it, one of the most significant of which is that such instruction encourages students to be interpreters of text.

One criticism of instructional research is that even if the work is pragmatically important, it is theoretically vacuous. I disagree with such analyses. In the case of transactional strategies instruction, there are multiple linkages to important theoretical perspectives. For example, transactional strategies discussions are simultaneously examples of applied schema theory and applied reader response theory: Meaning is jointly determined by what is in the text and what is in the minds of readers. As our understanding of comprehension improves,

new models of classroom communications should develop: How communications between diverse students and miscommunications between reading group participants shape the development of meaning are only two of the issues that should be addressed as the development of meaning in reading groups is studied. The implications of limited short-term memory capacity for classroom functioning is another example of an important theoretical direction that should be pursued as work on cognitive process instruction in classrooms continues. Transactional strategies instruction settings also provide a laboratory for studying the dynamics of constructivist instruction, since transactional strategies instruction is both exogenously and dialectically constructivist.

Much work on implementation in the classroom remains to be done. How transactional strategies instruction can be useful across all grade levels remains to be spelled out. That is, as my colleagues and I make progress in tailoring strategies instruction for the primary grades, we are haunted by an awareness of the need for much more comprehension instruction at the secondary level and perhaps beyond that (see Pressley, El-Dinary, & Brown, 1992). As we congratulate ourselves for coming to terms with what happens in reading groups, we know that our understanding of comprehension instruction during the remainder of the school day is much less complete. Even though much has been learned about how cognitive strategies can be taught, little is understood about how to develop teachers who are effective strategy instructors.

My own progress in the last four years in understanding effective strategies instruction was possible because I changed methodological tactics. Qualitative methods seemed better suited to the task of developing an understanding of large-scale instruction than the experimental methods I had relied on exclusively in the past. As I write this, Rachel Brown and I are completing data collection on a quasi-experimental evaluation of the efficacy of SAIL instruction; preliminary results suggest that a year of SAIL affects both standardized and nontraditional measures of comprehension. Tommie DePinto and I are planning another quasi-experimental study of the effectiveness of an alternative version of transactional strategies instruction, one that used Palincsar and Brown's (1984) reciprocal teaching as its starting point (Marks, et al., in press). I never gave up on experimentation (quasi-experimentation when random assignment is not possible). That is reflected in the work in progress and in the planning stages. Nonetheless, many of the dependent variables in these new quantitative studies are much more qualitative than experiments I conducted five or more years ago. In addition, I continue to believe that individual strategies often can (and should) be nurtured in the laboratory before they are transported to a complex world, as is exemplified by my ongoing research on elaborative interrogation (Pressley, Wood, et al., 1992). It is exciting to have one research foot in the laboratory and the other in the real world of schooling; it is also much more fully informative about cognitive strategies instruction than if both feet were planted in only one of the two worlds.

To return to the James' quote that opened this perspective, there is no doubt that I will be looking to effective teachers to inform me about the nature of high quality instruction.

With luck, I will continue to be able to say some things to them in return that they can take and use to improve their practice some more. Participating in never-ending cycles of researcher and teacher contact is an exciting and attractive career prospect for me. I suspect this career will benefit schoolchildren more certainly than if I had continued as an aloof psychologist who prescribed instruction on the basis of only carefully controlled experiments, observations, and theories far removed from the classroom world of teachers. A quote that seems appropriate for closing this chapter, which is directed principally at graduate students, was the title of Robert Frost's compilation for young readers: *You Come Too* (Frost, 1959).

Author's Note. The program of research summarized herein was supported in part by the National Reading Research Center of the University of Maryland; and at various times in part by grants from the General Research Board and the Graduate School of the University of Maryland, and by a grant from the McDonnell Foundation to Benchmark School. A version of this perspective appeared in a chapter in a volume edited by John Mangieri and Cathy Collins Block, *Creating Powerful Thinking in Teachers and Students: Diverse Perspectives*, that will be published in 1994 by Harcourt, Brace, Jovanovich. Correspondence concerning this perspective can be addressed to the first author at Department of Educational Psychology, University at Albany, State University of New York, Albany, NY 12222.

REFERENCES

Anderson, R. C. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.

Anderson, R. C., & Pearson, P. D. (1984). A schema-theoretic view of basic processes in reading comprehension. In P. D. Pearson (Ed.), *Handbook of reading research* (pp. 255-291). New York: Longman.

Anderson, V., & Roit, M. (in press). Collaborative strategy instruction: The meeting of minds. *Elementary School Journal*.

Bandura, A., (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Baron, J. (1985). *Rationality and intelligence*. London & New York: Cambridge University Press.

Bell, R. Q. (1968). A reinterpretation of the direction of effects in studies of socialization. *Psychological Review, 75*, 81-95.

Bereiter, C., & Bird, M. (1985). Use of thinking aloud in identification and teaching of reading comprehension strategies. *Cognition and Instruction, 2*, 91-130.

Borkowski, J. G., Carr, M., Rellinger, E. A., & Pressley, M. (1990). Self-regulated strategy use: Interdependencies of metacognition, attributions, and self-esteem. In B. F. Jones & L. Idol (Eds.), *Dimensions of thinking: Review of research* (pp. 53-92). Hillsdale NJ: Erlbaum.

Bowers, C. A., & Flinders, D. J. (1990). *Responsive teaching: An ecological approach to classroom patterns of language, culture, and thought*. New York: Teachers College Press.

Boy, G. (1991). *Intelligent assistant systems*. London & San Diego: Academic Press.

Brown, A. L., Bransford, J. P., & Ferrara, R. A., Campione, J. C. (1983). Learning, remembering, and understanding. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology*: Vol. 3. *Cognitive development* (pp. 177-206). New York: Wiley.

Brown, A. L., & Ferrara, R. A. (1985). Diagnosing zones of proximal development. In J. V. Wertsch (Ed.), *Culture, communication, and cognition: Vygotskian perspectives* (pp. 273-305). London & New York: Cambridge University Press.

Brown, R., & Coy-Ogan, L. C. (1993). The evolution of transactional strategies instruction in one teacher's classroom. *Elementary School Journal, 94*, 221-233.

Cazden, C. B. (1988). *Classroom discourse*. Portsmouth, NH: Heinemann Books.

Chi, M. T. H., Glaser, R., & Farr, M. J. (Eds.) (1988). *The nature of expertise*. Hillsdale, NJ: Erlbaum.

Childs, C. P., & Greenfield, P. M. (1980). Informal modes of learning and teaching: The case of Zinacanteco weaving. In N. Warren (Ed.), *Studies in cross-cultural psychology*, (Vol. 2, pp. 169-216). London: Academic Press.

Chipman, S. F., Segal, J. W., & Glaser, R. (1985). *Thinking and learning skills: Vol. 2 Research and open questions*. Hillsdale, NJ: Erlbaum.

Collins, C. (1991). Reading instruction that increases thinking abilities. *Journal of Reading, 34*, 510-516.

Cooke, N. J. (1989). The elicitation of domain-related ideas: Stage one of the knowledge acquisition process. In C. Ellis (Ed.), *Expert knowledge and explanation: The knowledge-language interface* (pp. 58-75). New York: John Wiley & Sons, Halsted Press.

Day, J. D. (1983). The zone of proximal development. In M. Pressley & J. R. Levin (Eds.), *Cognitive strategy research: Psychological foundations* (pp. 155-175). Berlin & New York: Springer-Verlag.

Deshler, D. D., & Schumaker, J. R. (1988). An instructional model for teaching students how to learn. In J. L. Graden, J. E. Zins, & M. J. Curtis (Eds.), *Alternative educational delivery systems: Enhancing instructional outcomes for all students* (pp. 391-411). Washington, DC: National Association of School Psychologists.

Duffy, G., Roehler, L., & Herrmann, G. (1988). Modeling mental processes helps poor readers become strategic readers. *Reading Teacher, 41*, 762-767.

Duffy, G. G., Roehler, L. R., Sivan, E., Rackliffe, G., Book, C., Meloth, M., Vavrus, L. G., Wesselman, R., Putnam, J., & Bassiri, D. (1987). Effects of explaining the reasoning associated with using reading strategies. *Reading Research Quarterly, 22*, 347-368.

El-Dinary, P. B., Pressley, M., & Schuder, T. (1992). Becoming a strategies teacher: An observational and interview study of three teachers learning transactional strategies instruction. In C. Kinzer & D. Leu (Eds.), *Forty-first Yearbook of the National Reading Conference* (pp. 453-462). Chicago: National Reading Conference.

El-Dinary, P. B., & Schuder, T. (1993). Seven teachers' acceptance of transactional strategies instruction during their first year using it. *Elementary School Journal, 94*, 207-219.

Ellis, C. (1989). Explanation in intelligent systems. In C. Ellis (Ed.), *Expert knowledge and explanation: The knowledge-language interface* (pp. 108-126). New York: John Wiley & Sons, Halsted Press.

Englert, C. S., Raphael, T. E., Anderson, L. M., Anthony, H. M., & Stevens, D. D. (1991). Making strategies and self-talk visible: Writing instruction in regular and special education classrooms. *American Educational Research Journal, 28*, 337-372.

Flavell, J. H. (1963). *Developmental psychology of Jean Piaget*. New York: van Nostrand.

Flavell, J. H. (1970). Developmental studies of mediated memory. In H. W. Reese & L. P. Lipsitt (Eds.), *Advances in child development and behavior* (Vol. 5). New York: Academic Press.

Flower, L., Stein, V., Ackerman, J., Kantz, M. J., McCormick, K., & Peck, W. C. (1990). *Reading to write: Exploring a cognitive and social process*. New York & Oxford, ENG: Oxford University Press.

Frost, R. (1959). *You come too: Favorite poems for young readers*. New York: Henry Holt.

Gaskins, I. W., Anderson, R. C., Pressley, M., Cunicelli, E. A., & Satlow, E. (1993). The moves strategy instruction teachers make. *Elementary School Journal*.

Gaskins, I. W., & Elliot, T. T. (1991). *The Benchmark model for teaching thinking strategies: A manual for teachers*. Cambridge, MA: Brookline Books.

Greenfield, P. M. (1984). A theory of the teacher in the learning activities of everyday life. In B. Rogoff & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp. 117-138). Cambridge, MA: Harvard University Press.

Guthrie, J. T., Alvermann, D. E., et al. (1992). *National Center for the Study of Reading Proposal* (funded). College Park, MD & Athens, GA: University of Maryland & University of Georgia.

Harris, K. R., & Pressley, M. (1991). The nature of cognitive strategy instruction: Interactive strategy construction. *Exceptional Children, 57*, 392-404.

Hayes-Roth, F., Waterman, D. A., & Lenat, D. (1983). *Building expert systems*. Reading, MA: Addison-Wesley.

Hutchins, E. (1991). The social organization of distributed cognition. In L. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 283-307). Washington DC: American Psychological Association.

James, W. (1958). *Talks to teachers*. New York: Norton.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology, 6*, 293-323.

Levin, J. R., & Pressley, M. (1981). Improving children's prose comprehension: Selected strategies that seem to succeed. In C. M. Santa & B. L. Hayes (Eds.), *Children's prose comprehension: Research and practice* (pp. 44-71). Newark, DE: International Reading Association.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills: Sage.

Maida, A. S., & Deng, M. (1989). A language to allow expert systems to have beliefs about their users. In C. Ellis (Ed.), *Expert knowledge and explanation: The knowledge-language interface* (pp. 127- 143). New York: John Wiley & Sons, Halsted Press.

Marks, M. B., Pressley, M. Coley, J. D., Craig, S., Rose, W., & Gardner, R. (1993). Teachers' adaptations of reciprocal teaching: Progress toward a classroom-compatible version of reciprocal teaching. *Elementary School Journal, 94*, 267-283.

Mastropieri, M. A., & Scruggs, T. E. (1991). *Teaching students ways to remember: Strategies for learning mnemonically*. Cambridge, MA: Brookline Books.

Mehan, H. (1979). *Learning lessons: Social organization in the classroom*. Cambridge, MA: Harvard University Press.

Moshman, D. (1982). Exogenous, endogenous, and dialectical constructivism. *Developmental Review, 2*, 371-384.

Nickerson, R. S., Perkins, D. N., & Smith, E. E. (1985). *The teaching of thinking*. Hillsdale, NJ: Erlbaum.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoringactivities. *Cognition and Instruction, 1*, 117-175.

Paris, S. G., & Oka, E. R. (1986). Children's reading strategies, metacognition, and motivation. *Developmental Review, 6*, 25-56.

Pearson, P. D., & Dole, J. A. (1987). Explicit comprehension instruction: A review of research and a new conceptualization of instruction. *Elementary School Journal, 88*, 151-165.

Petitto, A. L. (1985). Division of labor: Procedural learning in teacher-led small groups. *Cognition & Instruction, 2*, 233-270.

Pontecorvo, C., & Zuccermaglio, C. (1990). A passage to literacy: Learning in social context.

In Y. M. Goodman (Ed.), *How children construct literacy: Piagetian perspectives* (pp. 59-98). Newark, DE: International Reading Association.

Pressley, M., & Associates (1990). *Cognitive strategy instruction that really improves children's academic performance*. Cambridge, MA: Brookline Books.

Pressley, M., Borkowski, J. G., & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate metacognition and knowledge. In R. Vasta & G. Whitehurst (Eds.), *Annals of child development*, (Vol. 4, pp. 89-129). Greenwich, CT: JAI Press.

Pressley, M., Borkowski, J. G., & Schneider, W. (1989). Good information processing: What it is and what education can do to promote it. *International Journal of Educational Research*, *13*, 857-867.

Pressley, M., El-Dinary, P. B., & Brown, R. (1992). Is good reading comprehension possible? In M. Pressley, K. R. Harris, & J. T. Guthrie (Eds.), *Promoting academic competence and literacy: Cognitive research and instructional innovation* (pp. 91-127). San Diego: Academic Press.

Pressley, M., El-Dinary, P. B., Brown, R., Schuder, T., Bergman, J. L., York, M., Gaskins, I. W., & Faculties and Administration of Benchmark School and the Montgomery County MD SAIL/SIA Programs (in press). A transactional strategies instruction Christmas carol. In A. McKeough, J. Lupart, & A. Marini (Eds.), *Teaching for transfer: Fostering generalization in learning*. Hillsdale, NJ: Erlbaum.

Pressley, M., El-Dinary, P. B., Gaskins, I. W., Schuder, T., Bergman, J. L., Almasi, J., & Brown, R. (1992). Beyond direct explanation: Transactional instruction of reading comprehension strategies. *Elementary School Journal*, *92*, 513-555.

Pressley, M., El-Dinary, P. B., Stein, S., Marks, M. B., & Brown, R. (1992). Good strategy instruction is motivating and interesting. In A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 333-358). Hillsdale, NJ: Erlbaum.

Pressley, M., Almasi, J., Schuder, T., Bergman, J., Hite, S., El-Dinary, P. B., and Brown, R. (in press). Transactional instruction of comprehension strategies: The Montgomery County MD SAIL program. *Reading and Writing Quarterly*, *10*, 5-19.

Pressley, M., Gaskins, I. W., Cunicelli, E. A., Burdick, N. J., Schaub-Matt, M., Lee, D. S., & Powell, N. (1991). Strategy instruction at Benchmark School: A faculty interview study. *Learning Disability Quarterly*, *14*, 19-48.

Pressley, M., Gaskins, I. W., Wile, D., Cunicelli, E. A., & Sheridan, J. (1991). Teaching literacy strategies across the curriculum: A case study at Benchmark School. In J. Zutell & S. McCormick (Eds.), *Learner factors/teacher factors: Issues in literacy research and instruction* (pp.219-228). Chicago: National Reading Conference.

Pressley, M., Goodchild, F., Fleet, J., Zajchowski, R., & Evans, E. D. (1989). The challenges of classroom strategy instruction. *Elementary School Journal*, *89*, 301-342.

Pressley, M., Harris, K. R., & Marks, M. B. (1992). But good strategy instructors are constructivists! *Educational Psychology Review*, *4*,3-31.

Pressley, M., Johnson, C. J., Symons, S., McGoldrick, J. A., & Kurita, J. (1989). Strategies that improve memory and comprehension of what is read. *Elementary School Journal*, *90*, 3-32.

Pressley, M., Schuder, T., SAIL Faculty and Administration, Bergman, J. L., El-Dinary, P. B. (1992). A researcher-educator collaborative interview study of transactional comprehension strategies instruction. *Journal of Educational Psychology*.

BEST COPY AVAILABLE

Pressley, M., Snyder, B. L., & Cariglia-Bull, T. (1987). How can good strategy use be taught to children? In S. M. Cormier & J. D. Hagman (Eds.), *Transfer of learning: Contemporary approaches and applications* (pp. 81-120). Orlando, FL: Academic Press.

Pressley, M., Wood, E., Woloshyn, V. E., Martin, V., King, A., & Menke, D. (1992). Encouraging mindful use of prior knowledge: Attempting to construct explanatory answers facilitates learning. *Educational Psychologist, 27*, 91-110.

Resnick, L. B. (1987). Constructing knowledge in school. In L. S. Liben (Ed.), *Development and learning: Conflict or congruence?* (pp. 19-50). Hillsdale, NJ: Erlbaum.

Rosenblatt, L. M. (1978). *The reader, the text, the poem: The transactional theory of the literary work*. Carbondale, IL: Southern Illinois University Press.

Rosenshine, B. V. (1979). Content, time, and direct instruction. In P. L. Peterson & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings, and implications* (pp. 28-55). Berkeley, CA: McCutchan.

Rosenshine, B. V., & Meisner, C. (1994). *Nineteen experimental studies which used reciprocal teaching: A review of research*. Manuscript submitted for publication consideration. Champaign IL: University of Illinois, Department of Educational Psychology.

Schank, R. C., & Leake, D. B. (1989). Creativity and learning in a case-based explainer. *Artificial Intelligence International Journal, 40*, 353-385.

Schneider, W., & Pressley, M. (1989). *Memory development between 2 and 20*. New York: Springer-Verlag.

Segal, J. W., Chipman, S. F., & Glaser, R. (1985). *Thinking and learning skills: Vol. 1, Relating instruction to research*. Hillsdale, NJ: Erlbaum.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research*. Newbury Park, CA: Sage.

Tharpe, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. London & New York. Cambridge University Press.

Vygotsky, L. S. (1962). *Thought and speech*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. Goethals (Eds.), *Theories of group behavior* (pp. 185-208). New York: Springer-Verlag.

Weiner, J. L. (1989). The effect of user models on the production of explanations. In C. Ellis (Ed.), *Expert knowledge and explanation: The knowledge-language interface* (pp. 144-156). New York: John Wiley & Sons, Halsted Press.

Wertsch, J. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA: Harvard University Press.

Wood, P., Bruner, J., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89-100.

Zimmerman, B. J., & Schunk, D. H. (1989) (Eds.), *Self-regulated learning and academic achievement*. New York: Springer-Verlag.

[redacted]

[redacted]

NRRC National Reading Research Center

318 Aderhold, University of Georgia, Athens, Georgia 30602-7125
2102 J. M. Patterson Building, University of Maryland, College Park, MD 20742